

Cross-Layer or Not? 10 dB or not 10 dB

Ray Pickholtz
GWU

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE 01 DEC 2007		2. REPORT TYPE N/A		3. DATES COVERED	
4. TITLE AND SUBTITLE Panel Discussion - Cross-Layer or Not? 10 dB or not 10 dB				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) George Washington University				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release, distribution unlimited.					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT UU	18. NUMBER OF PAGES 6	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

Recall Reasons for Layering

- Simple, modular, decoupled functionality.
- Changes in one layer does not effect others.
- Minimize “spaghetti” coding.
- Established legacy. Bugs worked out.
- Scalable (IPv6)

**Adventures in Cross Layering will
trigger “The Law of Unintended
Consequences”.**

Problems and Opportunities for Cross Layering

- Layering is too constraining and inefficient.
- In wireless, the physical layer plays a major role – fading, Multipath, interference mitigation requires involvement of MAC layer.
- Optimum routing in ad-hoc involves network layer.
- Smart Energy use, location and application awareness and security involves MAC, Network and application layers.

Military Wireless Networks (Intelligent Adversary)

- Jamming > sense, analyze and take action
 - FH, smart antenna, adaptive data, code rate, etc.
- LPI > adjust power, code rates, data rates
- Security > DOS, authentication, encryption
- Unique latency issues > real time control
- Partial destruction > rerouting
- Reconfigurable > change bands, signal formats
- Sensor networks

Unintended Consequences

- Tendency towards proprietary protocols.
 - Dissimilar, incompatible, away from universal.
 - Optimization for specific circumstances.
 - Legacy and universal acceptance is lost. Lifetime costs.
 - Inhibition of user creativity, impede technology growth.
- “Spaghetti code.”
 - Inflexible, difficult to change.
 - Prone to flaws.
 - Prone to instabilities (loops with latencies).
 - Interactions may be adverse and cancel any gains.
- Optimization is a target for Intelligent Adversary

One Size Fits All Will Not Work

- Always have no cross layer as a backup
- Discrete Switchable Layer functionality